Evaluation of Construction and Plugging Procedures for the San Joaquin Renewables Class VI Project

In June 2022, EPA provided questions presented in *blue italicized text* to San Joaquin Renewables (SJRenew) about the Injection Well Plugging Plan (5_Injection--Well--Plugging--Plan) submitted as part of SJRenew's Class VI permit application (dated October 13, 2021) for the proposed SJRenew Class VI geologic sequestration (GS) facility. In response, SJRenew provided updated Injection Well Plugging Plan (Attachment D_Injection Well Plugging Plan_090722), Narrative (Attachment A_SJR_Narrative_090822), Post Injection Site Care Plan (Attachment E_PISC_090722), and Testing and Monitoring Plan (Attachment C Testing and Monitoring Plan_090722) documents that incorporated updated well construction, plugging, and abandonment information. SJRenew also provided a document summarizing their responses (Response_090822) to EPA on September 8, 2022. EPA's evaluation of how these updated plans address its questions and requests for revisions and additional information are presented in *red italicized text* below.

Injection Well Construction

SJR did not submit a separate well construction plan, but Section 3 of the permit application narrative describes the proposed injection well construction design. The proposed injection well design schematic is presented in Figure 3-1 of the narrative. The figure shows the position of the various casing strings, tubing, packers, and perforations to be implemented in the SJR-I1 injection well.

The proposed injection well will be a new vertical well. SJR will determine the final perforation intervals based on the results of pre-operational well logs and formation sampling (see additional evaluation under "Injection Well Pre-Operational Testing," below). However, the perforations are preliminarily anticipated to be as follows (based on the cement casing details on the proposed wellbore schematic):

- From 7,775 to 7,789 feet below ground surface (bgs) in the Pyramid Hills Formation (PH),
- From 7,789 to 7,900 feet bgs in the Vedder 1 (V1) Sands,
- From 8,040 to 8,132 feet bgs in the Vedder 2 (V2) Sands, and
- From 8,167 feet to 8,255 feet bgs in the Vedder 3 (V3) Sands.

While, as the application notes, the final perforation depths will be determined based on pre-operational testing, the well schematic appears to be consistent with information about the depth of the Pyramid Hills and Vedder Formations in the narrative.

The narrative states that well materials will be compatible with the CO_2 injectate and will limit corrosion, including the use of standard J55 and N80 steels for surface and intermediate casing. According to the narrative, the injection casing may be able to be installed using standard L80 or lower specifications, assuming the estimated purity of the carbon dioxide injection stream is accurate. Another option would be to place 13Cr casing across the injection sands below the intermediate pipe, and non-chrome inside the intermediate section. All casing strings will be cemented to the surface, and a dual completion will enable two injection zones. SJR did not describe the pre-operational testing plan to confirm the composition, properties, and corrosiveness of the injectate and its compatibility with well construction materials. This will be needed prior to operation of Well SJR-I1.

The narrative states that “intermediate casing will be placed across fresh water and USDW zones, with a shoe at 2,600 ft bgs” (p. 30); per the Class VI Rule, the surface casing must be set and cemented to the depth of the lowermost USDW. The proposed depth of the casing shoe appears to be appropriate based on information in the narrative about the depth to the USDW.

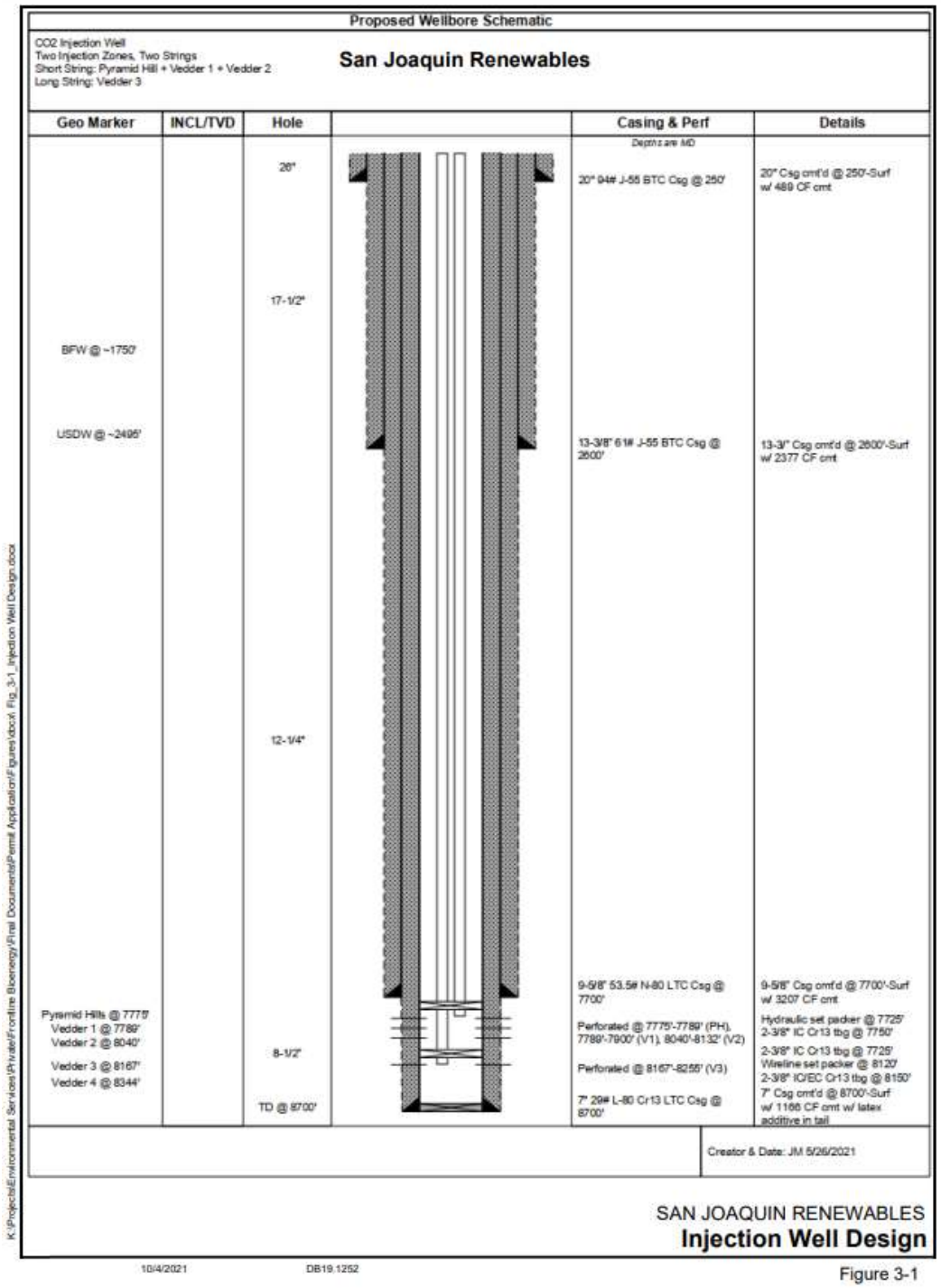

Figure 3-1

The applicant states that conventional Class G cement will be adequate for the surface and intermediate casings, and a latex additive in the tail cement for the injection casing will help eliminate potential gas migration. The narrative also states that all casing strings will be cemented to surface.

The permit application narrative (on pg. 14) notes that the "The eastern homocline of the San Joaquin Basin Province overlies the granite basement. The nature of the prograding, agrading, and retrograding stratigraphy indicates that the basin formed at a variable but increasing subsidence rate." The effects of subsidence on the mechanical integrity of injection wells have been cited as a concern in other California oil fields, and some operators have developed mitigation measures to relieve stress on the surface casing (e.g., via wellhead design that allows differential movement between the casings). Any design modifications to address the subsidence concern will need to meet the requirement that Class VI wells have cementing of the surface casing that extends to the surface.

Questions/Requests for the applicant:

- *The narrative (pg. 31) states that "The dual injection string design … using 2 3/8" tubing may restrict certain logging options to special smaller diameter logging tools." Please confirm that SJR will be able to perform the required mechanical integrity tests (MITs), or other tests given the small tubing diameter.*

  SJRenew responded that their drilling subcontractor (Driltek) does not anticipate any issues conducting MITs or other required tests through the smaller diameter tubing. The response is acceptable.

- *Please include the continuous recording devices that will be installed to monitor injection pressure, rate, and volume (as described in the Testing and Monitoring Plan) on the injection well schematic.*

  The pressure, rate, and volume monitoring equipment have been added to the revised Testing and Monitoring Plan in Section 2.2 (pg. 3), summarized in Table 1, and to the well schematics provided in Appendix B. Additionally, example product cut sheets of the monitoring equipment are also included in Appendix B. The response is acceptable.

- *Please provide a description of the safety valves and shut-off devices required at 40 CFR 146.88(e)(2) and how they will be linked to the continuous injection and annulus monitoring system.*

  A CO_2 injection process schematic was provided in Appendix B of the updated Testing and Monitoring Plan illustrating the process flow and positioning of mass flow valves, pressure indicators, and safety/choke shut off valves. The response is acceptable.

- *Please describe in the well construction procedures that the annulus between the tubing and the long string casing will be filled with a non-corrosive fluid, as required by 40 CFR 146.88(c), and describe the fluid.*

SJRenew responded that the packer fluid will consist of water with corrosion inhibiting additives. This description has been added to Section 5.2 of the Narrative Report. The response is acceptable.

- *Please confirm that the surface casing extends to through the base of the lowermost USDW, as required per 40 CFR 146.86(b)(2).*

  SJRenew responded that the surface casing will be installed through the base of the lowermost USDW (~2,495 ft) to a depth of 2,600 ft. These details are also included on the injection well schematic provided as Figure 5-1. The response is acceptable.

- *Please clarify that the surface (not intermediate) casing will be set and cemented to the depth of the lowermost USDW.*

  Section 5.2 states that the surface casing will extend through the lowermost USDW; this is supported by the injection well schematic provided as Figure 5-1. The response is acceptable.

- *Please provide well construction details in table form (i.e., using the "Construction Details" template that is available in the GSDT) for the following:*
  - *Open Hole Diameters and Intervals;*
  - *Casing Specifications;*
  - *Tubing Specifications (including tensile, burst, and collapse strengths); and*
  - *Packer Specifications.*

  The applicant provided the requested information (except the conductor casing and packer specifications) in Table 5-1 of the revised Narrative document.

- *Please explain how the injection well's design will mitigate shallow compression that has been shown to occur in California oil fields.*

  SJRenew responded that shallow compression common to California oil fields is more relevant to depletion and mass removal, whereas the injection project is adding mass into the subsurface and not contributing to mass removal. Please be prepared to further discuss this issue with EPA and/or CalGEM.

Follow-up Questions/Requests for the Applicant:

- *Please update Table 5-1 to include information about the conductor casing.*
- *Please provide the packer specifications; for clarity, EPA recommends that the tubing and packer specifications be provided in a single table (as recommended in the "Injection Well Plugging" template that is available in the GSDT).*
- *Please provide all relevant information about the well's construction in a stand-alone document that is suitable to attach to a Class VI permit.*

Objectives for Pre-Operational Testing:

- *Confirm the composition of the CO_2 injectate as part of baseline sampling and provide verification that it is compatible with the well materials and cement.*
- *Confirm the depth to the lowermost USDW to ensure the proper depth and cementing of the surface casing.*

Injection Well Pre-Operational Testing

The proposed pre-operational formation and well testing program required at 40 CFR 146.82(a)(8) and 146.87 is described in Section 3 of the permit application narrative and the "Recommended Pre-Injection Logging and Testing Program" (Attachment 2) of the application package. The document describes tests and logs to be performed: at the surface hole location, intermediate hole section, injection hole section, surface casing, intermediate casing, and injection casing. Additionally, SJR states that several 30' whole cores will be taken to evaluate fluid and rock properties to calibrate against open hole logs. The recommended testing and logging is considered comprehensive and acceptable with the exception of the comments/questions listed below and should be incorporated into a final proposed pre-operational testing plan.

SJR states in the Quality Assurance and Surveillance Plan (Data Management and Reporting) that project data and records will be compiled and maintained as they are generated. Additionally, laboratory tests will be reviewed for accuracy and completeness before data is submitted.

Questions/Requests for the applicant:

- *Please clarify which of the logging procedures described for the surface casing, intermediate casing, etc. will be performed during vs. after casing installation (i.e., per 40 CFR 146.87(a)(2) and (3)).*

  The applicant responded that the logging procedures before and after the casing runs were added to the updated Preoperational Testing Plan. These are now included in Sections 2.1 and 2.2. The response is acceptable.

- *Please provide testing methods and procedures for the tests to be performed on the new injector.*

  The applicant responded that the updated Pre-operational Testing Plan has been revised to note that the test methods will be consistent with U.S. EPA Testing and Monitoring Guidance and the updated Testing and Monitoring Plan. However, the Class VI Testing and Monitoring Guidance does not provide specific testing procedures. It is assumed that the reference to the Testing and Monitoring Plan refers to MIT procedures, which are documented in the plan. The response is acceptable.

- *Please add the following to the pre-operational testing plan to be consistent with 40 CFR 146.87 and meet the pre-operational testing objectives as described in the site characterization evaluation (see below):*
  - *Deviation checks (including the frequency of deviation checks to be performed during*

drilling).

- *Caliper logs before the surface, intermediate, and long string casing are installed.*
- *Standard annulus pressure test (SAPT).*
- *Testing to determine the geochemistry of the formation fluids and confirm the inputs to the geochemical modeling, determine the depth of the lowermost USDW, and confirm that no other formations are USDWs, and establish the baseline geochemistry of the USDW and the Vedder Formation in all monitoring wells.*
- *Leak-off test or step rate test to determine fracture pressure after the well has been perforated, as described in the narrative (pg. 30).*
- *Pressure fall-off, pump test, or injectivity tests to determine the injection zone hydrogeologic characteristics.*
- *Testing to provide evidence of fault sealing within the Pond-Poso Creek Fault Complex.*
- *Testing to establish baseline seismicity.*

Most of the above recommended tests were added to the updated Pre-Operational Testing Plan. However, testing to determine the sealing nature of faults and fractures was not included because, SJRenew asserts, sufficient data regarding fault sealing within the Pond-Poso Creek Fault Complex has already been provided in the Narrative and AoR CA portions of the application. The inclusion of the other requested testing is confirmed and the response to these requests is sufficient.

- *Please update the "Recommended Pre-Injection Logging and Testing Program" document to clarify that these are the pre-operational tests that SJR intends to perform (i.e., that they are not merely recommendations).*

  The term "recommended" was removed from the updated Preoperational Testing Plan. The response is acceptable.

- *Please clarify that SJR will notify the Director at least 30 days prior to conducting any testing.*

  The notification was added to Section 1 of the updated Preoperational Testing Plan. The response is acceptable.

Follow-up Questions/Requests for the Applicant:

- *EPA requests SJRenew add to the coring program in the pre-operational testing plan for core data across the Pond-Poso Creek Fault Complex to provide additional evidence of fault sealing. Any new information or data from pre-operational testing about the sealing nature of faults and/or seismicity should be provided in the updated narrative and AoR CA after pre-operational testing is complete.*

Objectives for Pre-Operational Testing

Based on the site characterization, AoR delineation modeling, and testing and monitoring evaluations, EPA has identified the following objectives for the planned pre-operational testing to address data gaps identified during these reviews. This information is summarized below (along with the planned tests that

will address each data need) for reference and to clarify EPA's expectations for the updated materials that SJR must submit pursuant to 40 CFR 146.82(c).

Regional Geology and Geologic Structure

- Determine, based on pre-operational testing, which of the Vedder Formation intervals will ultimately be selected as the injection zones (anticipated testing methods: whole core analyses).

Faults and Fractures

- Collect data (i.e., geochemical and pressure) to provide evidence of fault sealing within the Pond-Poso Creek Fault Complex (anticipated testing methods: TBD).

Hydrologic and Hydrogeologic Information

- Establish the depth of the lowermost USDW within the AoR (anticipated testing methods: TBD).
- Sample all formations during drilling of the injection well and deep monitoring wells to confirm that no other formations are USDWs (anticipated testing methods: TBD)

Geochemistry/Geochemical Data

- Characterize the baseline geochemistry of the USDW and the Vedder Formation and in all wells to be monitored for all parameters described in the Testing and Monitoring Plan to: (1) confirm the inputs to the geochemical modeling, and (2) establish a baseline for monitoring (anticipated testing methods: TBD).

Geomechanical and Petrophysical Characterization

- Gather site-specific measurements during drilling of the injection well and deep monitoring well of: capillary pressure; information on fractures, stress, ductility, rock strength, elastic properties; and in situ fluid pressures within the confining zone to support an evaluation of confining zone integrity (anticipated testing methods: logging and core analyses, e.g., tri-axial tests, pore compressibility, etc.).
- Confirm/characterize the geomechanical and petrophysical properties (including porosity and permeability) of the Vedder and Freeman-Jewett Formations and other relevant formations to confirm the representativeness of data from nearby oil fields (anticipated testing methods: core analyses, e.g., porosity/permeability analyses, core descriptions, saturations, etc.).

Mineralogy of the Injection and Confining Zones

- Perform a mineralogic analysis of the injection zone and confining zone solids that represents the project site (anticipated testing methods: core analyses, e.g., porosity/permeability analyses, core descriptions, saturations, etc.).

Seismic History and Seismic Risk

- Establish pressure in the injection zone (anticipated testing methods: geomechanical measurements of the injection and confining zones).
- Establish baseline seismicity (anticipated testing methods: TBD).

Facies Changes in the Injection or Confining Zones

- Confirm the thickness of the Vedder Formation sands at the location of the injection and monitoring wells to provide additional information on their suitability for injection, including

facies changes that could facilitate preferential flow (anticipated testing methods: cores and well logging data).

CO_2 Stream Compatibility with Subsurface Fluids and Minerals

- Confirm the composition of the CO_2 injectate as part of baseline sampling and provide verification that it will not react with the formation matrix (anticipated testing methods: injectate analysis and core sampling).
- Generate fluid chemistry and mineralogic data, pressure, temperature, and pH conditions at depth to confirm the inputs to the geochemical modeling (anticipated testing methods: core sampling and formation testing in the injection and monitoring wells).

Confining Zone Integrity

- Determine the maximum allowable injection pressure (anticipated testing methods: fall-off testing and injectivity testing).
- Confirm the fracture pressure of the injection zone via one or more of the following methods:
    - Triaxial stress test for rock mechanics for a static measurement from the rock core.
    - Dipole full wave sonic log, to provide a dynamic result that can be calibrated back to the static triaxial test.
    - Leak-off test or step rate test to determine fracture pressure after the well has been perforated.

The applicant added these objectives to the updated Preoperational Testing Plan and described the specific test methods and/or procedures they will use to meet each objective and referenced where in the permit application the objectives are discussed. The locations of core intervals to be sampled are presented on the proposed wellbore schematic provided as Figure 1, and includes samples in the Olcese, Freeman-Jewett, and Pyramid Hills. The response is acceptable.

Monitoring Well Construction

EPA recommends in Class VI guidance that monitoring well construction be reviewed in a manner that is similar to the injection well review (especially for the deep ground water monitoring wells). SJR describes plans to construct two deep monitoring wells in the Testing and Monitoring Plan:

- One well to be installed above the confining zone (the ACZ well). SJR indicates that the location and design of the ACZ well will be finalized at a later phase but will be in the vicinity of the injection well.
- An injection zone (IZ) monitoring well will be installed for plume and pressure front tracking within the Vedder Formation. The IZ well will be located updip of the project and will be perforated within the Vedder Formation. The IZ monitoring well will be fitted with a downhole transducer deployed for continuous pressure measurement.

Additionally, SJR describes planned monitoring in six shallow production wells that are routinely monitored by the Southern San Joaquin Municipal Utility District (SSJMUD). These are existing wells, completed above the confining zone.

Note, EPA understands that the California Regional Water Quality Control Board will need to approve the construction of any new monitoring well. While this will not be a UIC permit condition, it is relevant to SJR's planning of its monitoring well network and is being shared for informational purposes.

Questions/Requests for the applicant:

- Please provide schematics for the above confining zone and injection formation monitoring wells that are described in the Testing and Monitoring Plan for EPA to review prior to their installation and construction. The schematics should include the sampling equipment and downhole pressure monitoring gauges needed to perform all monitoring described.

  SJRenew included proposed well schematics for the IZ and ACZ monitoring wells in Appendix B of the updated Testing and Monitoring Plan. The monitoring well schematics do not include the monitoring and sampling equipment, however. See the testing and monitoring evaluation for a follow-up request.

- If construction schematics for the six USDW monitoring wells are available, please include them in the permit application.

  SJRenew responded that these schematics will be requested from the South San Joaquin Municipal Utility District (SSJMUD) once a memorandum of understanding is established. This language was added to Section 6.2 of the updated Testing and Monitoring Plan. Specific details about the SSJMUD USDW monitoring wells are summarized in Table 4-3 of Appendix C to the updated Testing and Monitoring Plan. The response is acceptable.

Injection Well Plugging Plan

Plugging details for Well SJR-I1 are provided in an attachment titled, "Recommended Injection Well Plugging and Abandonment Plan," dated July 8, 2021. Before plugging the injection well, SJR will determine the bottom-hole pressure needed to successfully squeeze cement for plugging operations as referenced in the Injection Well Plugging Plan. Procedures for plugging the injection well are described in the Injection Well Plugging Plan, which include the following:

- Squeeze cement into the perforations through a cement retainer.
- A coiled tubing unit (CTU) will be used to place cement at intervals from plugged back total depth (PBTD) to surface to conform with applicable U.S. EPA standards for a Class VI well.
- Move in and rig up (MIRU) equipment on location including blowout prevention equipment (BOPE).
- Run wireline survey to measure bottomhole pressure and confirm PBTD.
- Kill well with brine of appropriate density to prevent flowback.
- Pull completion tubing and packers.
- Land corrosion resistant cement retainer at 7700'.
- Rig up (RU) cementers. Down squeeze cement through tubing and retainer until pressure increases but remains below formation fracture gradient. Calculate maximum allowable injection pressure based on bottomhole pressure data.
- Un-sting tubing from retainer and pull out of hole (POOH).
- RU CTU and place continuous cement plug from top of retainer at 7700' to surface.
- Rig down CTU and cementers.
- Nipple down (ND) BOPE. Rig down move out (RDMO).
- Dig out cellar, cut casing ten feet below ground level (GL) and flush with outer casings.

- Weld steel plate on top of casing marked with well API and injection permit number.
- Survey final well location.
- Backfill cellar, clean location, and remove all debris. RDMO all equipment and commence applicable surface reclamation efforts.

The plan does not describe a final mechanical integrity test or include a plugging schematic. The plugging procedures appear to be acceptable, provided responses to the questions below are adequate.

The plan also explains that a site closure report will be submitted to EPA within 90 days of monitoring well plugging and the documentation it will contain. However, the plan does not describe the procedures for closing the site.

Questions/Requests for the applicant:

- *Please provide a table with plugging details (e.g., about plugs, cement types/volumes) in table form (i.e., using the "Injection Well Plugging" template that is available in the GSDT or at https://www.epa.gov/uic/class-vi-permit-application-templates).*

  SJRenew provided plugging details in Table 2 of the updated Injection Well Plugging Plan. The table provides all of the information in the Injection Well Plugging template except for "Sacks of cement to be used" and the "Slurry weight." The details about the plugs provided in Table 2 do not match the information on the proposed plugging schematic: Table 2 identifies 4 plugs, but the schematic only shows Plug #1 and Plug #2.

- *Please include "flushing" among the steps to be completed prior to injection well plugging, in accordance with 40 CFR 146.92(a).*

  SJRenew responded that a KCL or CaCl weighted brine water will be placed in the well prior to cementing activities. This step was added to the Plugging Procedures section on page 3 of the updated Injection Well Plugging Plan. The response is acceptable.

- *Please also include planned MITs to be performed in accordance with 40 CFR 146.92(b)(2).*

  The planned MITs were added in Table 1 of the updated Injection Well Plugging Plan. The plan states that at least one of the tests listed in Table 1 (a temperature or oxygen activation log) will be conducted to verify the external mechanical integrity prior to plugging activities. This is consistent with 40 CFR 146.92(b)(2). The response is acceptable.

- *Please provide a plugging schematic for Well SJR-I1 and label the USDW and other relevant formations (i.e., the injection and confining zones) and perforations on the plugging diagram. The diagram should demonstrate the following:*
  - *That plugs will extend at least 100 feet below the lowermost USDW and*

    SJRenew provided a proposed plugging schematic on page 4 of the updated Injection Well Plugging Plan. Based on the schematic, a cement plug (Plug #2) will extend from 7,750 ft to

the surface, thus covering the lowermost USDW at a depth of 2,495 ft. The response is acceptable.

- *That the plugs will cover all perforations and the extent above the uppermost perforations, as determined based on pre-operational logging and testing (estimated range of 7,775' to 8,255' bgs).*

  SJRenew provided a proposed plugging schematic on page 4 of the updated Injection Well Plugging Plan. Based on the schematic, a cement squeeze will be conducted in each perforated section, and a cement plug (Plug #2) will then be placed from 7,750 ft to the surface. The response is acceptable.

- *Please describe the cement to be used. Specifically provide information to demonstrate that the cement:*
  - *Meets Class D, G, or H standards and is CO_2-resistant;*
  - *Is the same as or compatible with the cement used in the well's construction; and*
  - *Has adequate permeability and compressive strength.*

  The applicant responded that a CO_2-resistant, Class G cement will be used for plugging and abandonment. This is stated in Table 2 of the updated Injection Well Plugging Plan. Although not specifically stated in their response, it is assumed that the cement will be compatible, and have the same permeability and compressive strength qualities, as the CO_2-resistant, Class G cement that is proposed for the well's construction. The response is acceptable.

- *Please specify in the Well Plugging Plan that SJR will submit required closure documentation within the timeframes specified in 40 CFR 146.92, including a notice of intent to plug (at least 60 days prior to plugging the well) and a well plugging report (60 days following plugging completion).*

  The applicant added this language to the Notifications, Permits, and Inspections section on page 2 of the updated Injection Well Plugging Plan. The response is acceptable.

- *Please describe the procedures SJR will perform to close the site, e.g., landscaping material and equipment to be removed or staged onsite.*

  The applicant added text on page 3 of the updated Injection Well Plugging Plan that the surface will be reclaimed to match the surrounding land. The response is acceptable.

- *Please update the "Recommended Injection Well Plugging and Abandonment Plan" document to clarify that these are the plugging procedures that SJR intends to perform (i.e., that they are not merely recommendations).*

  The requested edit was not made throughout the Plugging Plan; it is still in the Plugging Procedures section on Page 2.

Follow-up Questions/Requests for the Applicant:

- *Please clarify the discrepancy regarding the volume or number of sacks of cement that will be used between Table 2 and the plugging schematic as noted above.*
- *Please clarify the discrepancy in numbering of the well plugs between the plugging schematic and Table 2.*
- *Please edit the second sentence under "Plugging Procedures" on page 2 to read, "SJR will follow the plugging and abandonment (P&A) operations described below to remove the injection tubing and packer, and squeeze cement into the perforations through a cement retainer."*

Monitoring Well Plugging Plan

The proposed plugging and abandonment procedures for the monitoring wells are described in Section 7 of the Post-Injection Site Care (PISC) and Site Closure Plan. The document describes the general procedures SJR will use to plug the monitoring wells, which are identical to those described for plugging the injection well. This section of the plan does not include any plugging schematics, which likely reflects the fact that plans for the monitoring wells have not been developed. However, they will be needed prior to EPA's approval of the PISC and Site Closure Plan.

Questions/Requests for the applicant:

- *Please ensure that the final monitoring well plugging procedures are specific to the construction and depth of each monitoring well.*

  The monitoring well plugging procedures were added to Section 8.1 of the updated PISC and Site Closure Plan. The procedures are generally consistent with the wellbore schematics included in Appendix A. However, there is a difference in the total depth of the injection zone monitoring well: the text mentions a total depth of ~7,200 feet, but the schematic indicates a total depth of 7,500 ft.

- *Please include plugging schematics for the monitoring wells in the PISC and Site Closure Plan.*

  The applicant provided monitoring well plugging schematics in Appendix A of the updated PISC and Site Closure Plan. The plugging schematics are consistent with the construction schematics for the ACZ and IZ monitoring wells. The response is acceptable.

- *Please clarify that the monitoring well procedures described will be performed on each of the deep monitoring wells, i.e., the ACZ and IZ wells.*

  The requested monitoring well plugging procedures have been added to Section 8.1 and Appendix A of the updated PISC and Site Closure Plan. The response is acceptable.

- *Please describe the procedures SJR will perform to close the site, e.g., landscaping material and equipment to be removed or staged onsite.*

  The applicant responded that the goal for reclamation will be for the site to match the surrounding land; however, the conditions are unknown at this time. The applicant added text to

the monitoring well plugging procedures in the updated Injection PISC and Site Closure Plan that the surface will be reclaimed to match the surrounding land. The response is acceptable.

- *Please describe the external MIT to be performed on the monitoring wells prior to abandonment.*

  Section 8.1 of the updated Post-Injection Site Care Plan states that an annular pressure test will be conducted prior to plugging activities to verify external casing integrity. The response is acceptable.

Follow-up Questions/Requests for the Applicant:

- *Please clarify the discrepancy in depth between the text and schematic of the Injection Zone monitoring well as described above.*

Corrective Action on Wells in the AoR

The Corrective Action Plan (Attachment 3 of the application package) lists oil and gas wells that are located within the delineated AoR based on CalGEM records. Nineteen (19) wells are located within the AoR, and each is a plugged and abandoned well; of these wells, seven (7) penetrate the confining zone. SJR submitted plugging records for each of the 19 wells to the GSDT, and a spreadsheet containing all of the information required at 40 CFR 146.82(a)(4).

According to the Corrective Action Plan, re-abandonment will be necessary for any well that penetrates the Freeman-Jewett if the well is uncased in the injection zone and the cement plug is not within the confining zone. Six of the seven wells within the AoR meet the aforementioned criteria and will require re-abandonment: Chevron 32-5, Curry 1, Del Fortuna, Ingram 13-73, KCL 87-25, and Tenneco 11x-31. The proposed plugging procedures and schematics are provided in Appendix C of the AoR and Corrective Action Plan.

Information about the seven wells in the AoR that penetrate the confining zone is presented in Table 2-1 of the Corrective Action Plan. The table contains all of the information required at 40 CFR 146.82(a)(4), except their types; the diameter of all but one of the wells were available on well schematics in Appendix C to the AoR CA.

SJR plans to implement corrective action on a phased basis. One well (Ingram 13-73, API #402980729) will be re-abandoned prior to commencing injection, and SJR proposes to re-plug the remaining five wells within three years of commencing injection activities.

Questions/Requests for the Applicant:

- *Please provide additional details for well re-abandonment, specifically approximate wait times for cement curing, in Appendix C.*
- *Please add to Table 2-1 of the Corrective Action Plan a column for well type.*
- *Consistent with 40 CFR 146.84(b)(2)(iv), please describe how corrective action will be adjusted if there are changes in the AoR and how site access will be guaranteed for future corrective action.*
  - *EPA also recommends that SJR describe that it will notify EPA prior to plugging the five wells for which corrective action will be performed on a phased basis.*

SJRenew responded that there are "no wells requiring corrective action in the revised AoR delineation." This is consistent with Section 5 of the updated AoR CA Plan and their revised approach for delineating the AoR. As noted in other reviews, confirmation of the acceptability of this revised AoR delineation approach is pending.